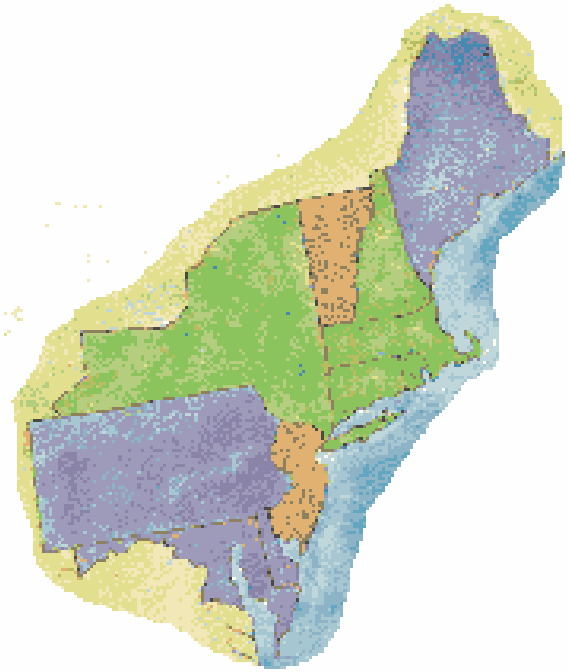
Commercial HVAC Standards & Specifications



2006 MT Symposium, Washington, DC

Jonathan Linn, Initiatives Manager, NEEP

March 20, 2006

HVAC Equipment Efficiency

Commercial Packaged HVAC Systems
Today and Tomorrow

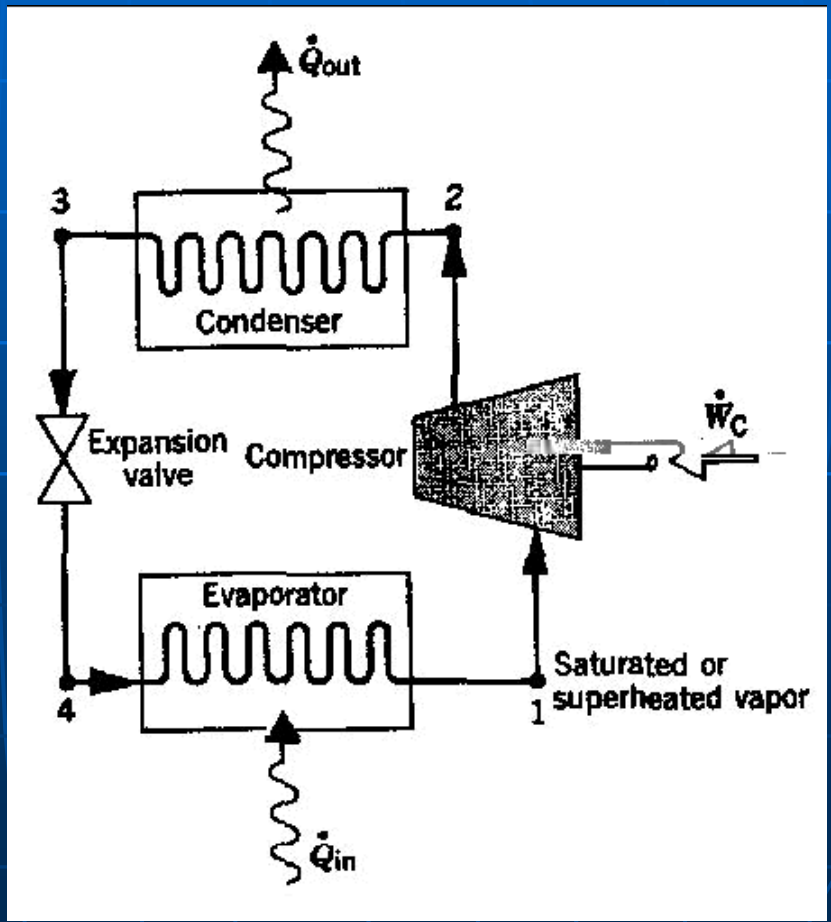
- Efficiency Terminology
- Mandatory Efficiency Standards
- Voluntary Specifications for Energy Savings
- In-Field Concerns

HVAC Equipment

Commercial Packaged HVAC

HVAC Equipment

Vapor Compression Cycle



HVAC Equipment Efficiency

EER = btuh/watt @ 95ºF

Measure of demand at full load

SEER = seasonal btu cooling/seasonal watt-hour cooling

Measure of energy used average through the year

HVAC Efficiency

Standard:

- DOE Rule
- Mandatory limit on manufacturers

Specification

- Recommendation by EE community
- Voluntary guide for buyers

Packaged HVAC

- **Residential AC**
  - Power: 1 Φ
  - Split system or Single Packaged
  - Most <5.4 ton
- **Commercial AC**
  - Power: 3 Φ
  - Packaged Rooftop
  - All sizes

HVAC Terminology

Ton of Refrigeration

- Cooling energy equivalent of one ton ice melted over course of one day
- 12,000 BTU/hr

1 ton Ice/day x 2,000 lb/ton x 144 btu/lb Φ x 1 day/24 hr = **12,000 btu/ton**

HVAC Size Categories

A			Unit	<	5.4t 65,000 btuh
B	5.4t 65,000 btuh	≤	Unit	<	11.25t 135,000 btuh
C	11.25t 135,000 btuh	≤	Unit	<	20t 240,000 btuh
D	20t 240,000 btuh	≤	Unit	<	60t 760,000 btuh
E	60t 760,000 btuh	≤	Unit		

HVAC Efficiency

Today

- DOE: Same as ASHRAE 90.1 1989
- CEE Tier 2: Current

			DOE	CEE T2
A	SS	SEER	10.0	13.0
	SP	SEER	9.7	13.0
B	SS&SP	EER	8.9	11.0
C	SS&SP	EER	8.5	10.8
D	SS&SP	EER	8.5	10.0
E	SS&SP	EER	8.2	10.0

HVAC Efficiency

January 2008

- DOE: Same as ASHRAE 90.1 1989, <5.4t to SEER 13
- CEE Tier 2: Current

			DOE	DOE 2008	CEE T2
A	SS	SEER	10.0	13.0	13.0
	SP	SEER	9.7	13.0	13.0
B	SS&SP	EER	8.9	8.9	11.0
C	SS&SP	EER	8.5	8.5	10.8
D	SS&SP	EER	8.5	8.5	10.0
E	SS&SP	EER	8.2	8.2	10.0

HVAC Efficiency

2008: Change What?

- DOE: Same as ASHRAE 90.1 1989, but <5.4t to SEER 13
- Tier X: Current, <5.4t to SEER 14 ? Or what?

			DOE today	DOE 2008	TierX
A	SS	SEER	10.0	13.0	14.0?
	SP	SEER	9.7	13.0	14.0?
B	SS&SP	EER	8.9	8.9	11.0
C	SS&SP	EER	8.5	8.5	10.8
D	SS&SP	EER	8.5	8.5	10.0
E	SS&SP	EER	8.2	8.2	10.0

HVAC Efficiency

Standards for Commercial Package Air Conditioners and Heat Pumps

Docket EE-RM/STD-01-375 November 11, 2000

- Air-Conditioning and Refrigeration Institute
- American Council for an Energy-Efficient Economy
- Aaon Heating and Cooling Products
- Alliance to Save Energy
- Appliance Standards Awareness Project
- Armstrong Air Conditioning Inc.
- California Energy Commission
- Carrier
- Daikin
- Lennox International Inc.
- Mammoth, Inc.
- McQuay International
- Natural Resources Defense Council
- Nordyne Inc.
- Northeast Energy Efficiency Partnerships
- Rheem Manufacturing Company
- Sanyo Fisher (USA) Corp.
- Trane/American Standard
- York International

HVAC Efficiency

2010 EPAct Changes

- DOE: 2010 Standard looks like today's Tier 2
- Tier Y: Who knows?????

			DOE 2010	TierY
A	SS	SEER	13.0	14.0?
	SP	SEER	13.0	14.0?
B	SS&SP	EER	11.0	?
C	SS&SP	EER	10.8	?
D	SS&SP	EER	10.0	?
E	SS&SP	EER	10.0	?

In Field Performance

- Air Flow/ Economizers, Etc.

In Field Performance

Operational Problems/Opportunities

Operational Problem	% of units affected	% Savings Potential
Refrigerant charge	46%	5-11%
Economizer	64%	14-40%
Air flow	42%	~10%
Thermostat	58%	up to 40%
Sensor	20%	up to 40%

In Field Performance

1. Test system for faults and efficiency

6. Review and process online

5. Upload from PDA to Internet

2. Document faults

3. Make repairs

4. Re-test and document post repair state

Thank You!

Northeast Energy Efficiency Partnerships

Jonathan Linn, Initiatives Manager

207-338-9705 jlinn@neep.org

www.neep.org